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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/053,253	11/02/2001	Michael A. Sherman	020910-000110US	8689
26541	7590	05/12/2004	EXAMINER	
RITTER, LANG & KAPLAN 12930 SARATOGA AE. SUITE D1 SARATOGA, CA 95070			SMITH, CAROLYN L	
		ART UNIT	PAPER NUMBER	
		1631		

DATE MAILED: 05/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/053,253	SHERMAN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Carolyn L Smith	1631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 24 November 2003 and 10 March 2004.
- 2a) This action is **FINAL**.                  2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-107 is/are pending in the application.
- 4a) Of the above claim(s) 16,24-34 and 41-107 is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-15,17-23 and 35-40 is/are rejected.
- 7) Claim(s) 1, 7, 12, 20, 21 is/are objected to.
- 8) Claim(s) 1-107 are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All
  - b) Some \*
  - c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 52902,32503,22304.
- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_.

**DETAILED ACTION**

Applicants' elections without traverse of Group I (claims 1-23 and 35-40) and the Radau5 implicit integrator (specie election), filed 11/24/03 and 3/10/04, are acknowledged. Amended claims 1, 13, 15, and 35, filed 11/24/03 and 3/10/04, are acknowledged. Claim 16 has been withdrawn from consideration as being drawn to a non-elected specie. Claims 24-34 and 41-107 are withdrawn from consideration as being drawn to non-elected Groups. The informational disclosure statements, filed 5/29/02, 3/25/03, 2/23/04, have been fully considered.

Claims herein under examination are 1-15, 17-23, and 35-40.

*Claim Objections*

Claims 7, 20, and 21 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 7 appears to be broader in scope than claim 1. Claim 21 appears to be broader in scope than claims from which it directly and indirectly depends. Claim 20 seems to be limited to the independent claim 13 Radau5 practice and thus is not further limiting from claims from which it depends.

Claims 1 and 12 are objected to because of the following minor informality: Claim 1 (line 6) recites the word "a" which does not make grammatical sense. Claim 12 fails to end in a period. Appropriate correction is requested.

***Specification***

The disclosure is objected to because of the following informalities: Several pages of the specification have hole punching problems due to the margins being too small as filed at the top of the many pages. These pages include 27-35. Please correct and resubmit specification sections which contain this margin problem.

Appropriate correction is required.

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-15, 17-23, and 35-40 are rejected under 35 U.S.C. 101 because the claims are directed to non-statutory subject matter. As written, claims 1-15, 17-23, and 35-40 encompass code or methods performed on a computer and appear to lack any physical result performed outside of a computer.

As stated in MPEP § 2106, (IV)(B)(2)(b), to be statutory, a claimed computer-related process must either: (A) result in a physical transformation outside the computer for which a practical application in the technological arts is either disclosed in the specification or would have been known to a skilled artisan (discussed in MPEP § 2106 (IV)(B)(2)(b)(i)), or (B) be limited to a practical application within the technological arts (discussed in MPEP § 2106 (IV)(B)(2)(b)(ii)).

As stated in MPEP § 2106 (IV)(B)(2)(b)(i), the independent physical acts may be post- or pre-computer processing activity as described below:

A process is statutory if it requires physical acts to be performed outside the computer independent of and following the steps to be performed by a programmed computer, where those acts involve the manipulation of tangible physical objects and result in the object having a different physical attribute or structure. *Diamond v. Diehr*, 450 U.S. at 187, 209 USPQ at 8. Thus, if a process claim includes one or more post-computer process steps that result in a physical transformation outside the computer (beyond merely conveying the direct result of the computer operation), the claim is clearly statutory.

Another statutory process is one that requires the measurements of physical objects or activities to be transformed outside of the computer into computer data (*In re Gelnovatch*, 595 F.2d 32, 41 n.7, 201 USPQ 136, 145 n.7 (CCPA 1979) (data-gathering step did not measure physical phenomenon); *Arrhythmia*, 958 F.2d at 1056, 22 USPQ2d at 1036), where the data comprises signals corresponding to physical objects or activities external to the computer system, and where the process causes a physical transformation of the signals which are intangible representations of the physical objects or activities. *Schrader*, 22 F.3d at 294, 30 USPQ2d at 1459 citing with approval *Arrhythmia*, 958 F.2d at 1058-59, 22 USPQ2d at 1037-38; *Abele*, 684 F.2d at 909, 214 USPQ at 688; *In re Taner*, 681 F.2d 787, 790, 214 USPQ 678, 681 (CCPA 1982).

As stated in MPEP § 2106 (IV)(B)(2)(b)(ii), the computer-related process may be limited to a practical application in the technological arts as described below:

There is always some form of physical transformation within a computer because a computer acts on signals and transforms them during its operation and changes the state of its components during the execution of a process. Even though such a physical transformation occurs within a computer, such activity is not determinative of whether the process is statutory because such transformation alone does not distinguish a statutory computer process from a nonstatutory computer process. What is determinative is not how the computer performs the process, but what the computer does to achieve a practical application. See *Arrhythmia*, 958 F.2d at 1057, 22 USPQ2d at 1036.

Claims 1-15, 17-23, and 35-40 do not fulfill either of these statutory requirements and are therefore rejected under 35 U.S.C. 101 because the claims are directed to non-statutory subject matter.

Claims 1-15, 17-23, and 35-40 are rejected under 35 U.S.C. 101 because the claims are directed to non-statutory subject matter. As written, the claims appear to be directed to a method that merely manipulates numbers, abstract concepts or ideas, or signals representing any of the foregoing.

As stated in MPEP § 2106, (IV)(B)(1), if the “acts” of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Schrader, 22 F.3d at 294-95, 30 USPQ2d at 1458-59. Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.

In practical terms, claims define nonstatutory processes if they:

- consist solely of mathematical operations without some claimed practical application (i.e., executing a “mathematical algorithm”); or
- simply manipulate abstract ideas, e.g., a bid (Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

Claims 1-15, 17-23, and 35-40 do not fulfill any of these statutory requirements and are therefore rejected under 35 U.S.C. 101 because the claims are directed to non-statutory subject matter.

***Claims Rejected Under 35 U.S.C. § 112 1<sup>st</sup> Paragraph***

The following is a quotation of the first paragraph of 35 U.S.C. § 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Factors to be considered in determining whether a disclosure would require undue experimentation have been summarized in Ex parte Forman, 230 USPQ 546 (BPAI 1986) and reiterated by the Court of Appeals in In re Wands, 8 USPQ2d 1400 at 1404 (CAFC 1988). The factors to be considered in determining whether undue experimentation is required include: (1) the quantity of experimentation necessary, (2) the amount or direction presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. The Board also stated that although the level of skill in molecular biology is high, the results of experiments in genetic engineering are unpredictable. While all of these factors are considered, a sufficient amount for a *prima facie* case are discussed below.

## LACK OF ENABLEMENT

Claims 1-15, 17-23, and 35-40 are rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The instant invention is directed to a method and computer code that involves integrating model equations with a Radau5 implicit integrator. The Radau5 implicit integrator is generally summarized in Figure 7. On pages 25 (line 22) to 26 (line 6) of the specification, applicants note

a printed publication by Hairer that provides essential material for practicing the instant invention.

The incorporation of essential material in the specification by reference to a foreign application or patent, or to a publication is improper. Applicant is required to amend the disclosure to include the material incorporated by reference. The amendment must be accompanied by an affidavit or declaration executed by the applicant, or a practitioner representing the applicant, stating that the amendatory material consists of the same material incorporated by reference in the referencing application. See *In re Hawkins*, 486 F.2d 569, 179 USPQ 157 (CCPA 1973); *In re Hawkins*, 486 F.2d 579, 179 USPQ 163 (CCPA 1973); and *In re Hawkins*, 486 F.2d 577, 179 USPQ 167 (CCPA 1973).

***Claims Rejected Under 35 U.S.C. § 112, Second Paragraph***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-15, 17-23, and 35-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

Claims 1, 13, and 35 (line 1 of each) recite the phrase “the behavior” which lacks proper antecedent basis. Correction of this problem may be accomplished by changing the word “the”

Art Unit: 1631

to "a". Claims 2-12, 14-15, 17-23, and 36-40 are also rejected due to their dependency from claims 1, 13, and 35.

Claim 13, line 7, recites the phrase "at least 100" which is vague and indefinite as it is unclear which units are to be used with this number. Clarification of the metes and bounds of this phrase, via clearer claim wording, is requested. Claims 14-15 and 17-23 are also rejected due to their direct or indirect dependency from claim 13.

Claims 7, 20, and 21 recite the limitation "said L-stable integrator". There is insufficient antecedent basis for this limitation in the claims.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-15, 17-23, and 35-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Holstad (Numerical Algorithms, Vol. 19, 1998, pages 95-110).

Holstad discloses a method and code of simulating coupled reactions and fluid flow (modeling molecular behavior) over long time periods by using differential algebraic equation system (model) with robust adaptive (varying) timestepping algorithms, such as RADAU5,

available in the solvers (RADAU5 implicit integrator in large timesteps) to derive numerical models (obtain behavior calculations) (abstract and page 102, last paragraph to page 103, second paragraph), as stated in instant claims 1, 3, 7, 20, 21, 35, and 36. Holstad discloses stiffness model properties (abstract), as stated in instant claims 5, 9, and 18. Holstad discloses research to understand processes taking place between chemical species (molecules) dissolved in fluid and minerals in rock (page 95, first paragraph). Holstad discloses numerical models where time steps can be dynamically changed (which represents varying over a range of at least 100) with explicit control of the errors (page 96, second paragraph), as stated in instant claims 4, 8, 13, 17, 19, and 37. Holstad discloses timescales of at millions of years (page 96, second paragraph) which represents large timesteps of at least 200 femtoseconds, as stated in instant claims 2 and 14. Holstad discloses a two-dimensional model represented in space by quadrilateral elements (Figure 1, with internal coordinates) with assigned mineral compositions (molecules), carbon concentrations, initial fluid composition, and temperature and fluid flow histories (speed calculations) (page 96, ninth paragraph; equations 1 and 2; and page 109, first paragraph), as stated in instant claims 11, 22, 38, and 39. Figure 1 provides a collection of arrows within the model which represents a torsion angle, rigid (multi)body model of chemical species A and B (molecules), as stated in instant claims 12, 23, and 40. Holstad discloses timestepping histories in Figures 6 and 7 (page 105, first paragraph). Holstad discloses a mathematical model (equations 26a and b) where the mineral occurs in one of three states (page 102, fourth dotted paragraph). Switching between the equilibrium state to the other two states results in varying the number of equations from time step to time step (page 102, fourth dotted paragraph) which represents avoiding energy conservation to obtain a minimum energy state for the mineral

(molecule), as stated in instant claims 6 and 10. Holstad discloses using the DAE (differential-algebraic system) has properties that make it challenging to solve numerically over long integration periods (page 102, fourth paragraph), but that RADAU5 is one DAE solver (page 102, last paragraph) which represents selecting RADAU5, as stated in instant claim 15. Holstad discloses the behavior of the minerals demands the Jacobian must be calculated analytically and at every time step (page 102, fourth dotted paragraph).

Thus, Holstad anticipates the instant invention.

### ***Conclusion***

No claim is allowed.

Papers related to this application may be submitted to Technical Center 1600 by facsimile transmission. Papers should be faxed to Technical Center 1600 via the PTO Fax Center located in Crystal Mall 1. The faxing of such papers must conform to the notices published in the Official Gazette, 1096 OG 30 (November 15, 1988), 1156 OG 61 (November 16, 1993), and 1157 OG 94 (December 28, 1993) (See 37 CFR §1.6(d)). The CM1 Fax Center number is (703) 872-9306.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn Smith, whose telephone number is (571) 272-0721. The examiner can normally be reached Monday through Thursday from 8 A.M. to 6:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Woodward, can be reached on (571) 272-0722.

Art Unit: 1631

Any inquiry of a general nature or relating to the status of this application should be directed to Legal Instruments Examiner Tina Plunkett whose telephone number is (571) 272-0549 or to the Technical Center receptionist whose telephone number is (703) 308-0196.

May 5, 2004

*Ardin H. Marschel*  
ARDIN H. MARSHEL  
PRIMARY EXAMINER  
5/11/04